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ABSTRACT

This document provides elementary teachers with an annotated index according to grade levels 1-6 of energy education topics in the "Holt Databank System" (Holt, Rinehart and Winston), followed by suggestions for activities related to the topics. Indexed topics, which comprise a major portion of the document, include basic energy information, society's dependence on energy, problems and advantages of energy alternatives, and energy issues relevant to the state of Minnesota. The index refers to the unit number, lesson number, and the appropriate pages in the teacher's guide. The background material for teachers presents definitions, lists energy sources, uses, and conservation techniques, and discusses states, storage, and conversion of energy. Related activities include energy bingo, presentation of television commercials to convince people to conserve energy, school and home energy surveys, and interviews with older people to determine how energy was used in the early part of the 20th century. (KC)

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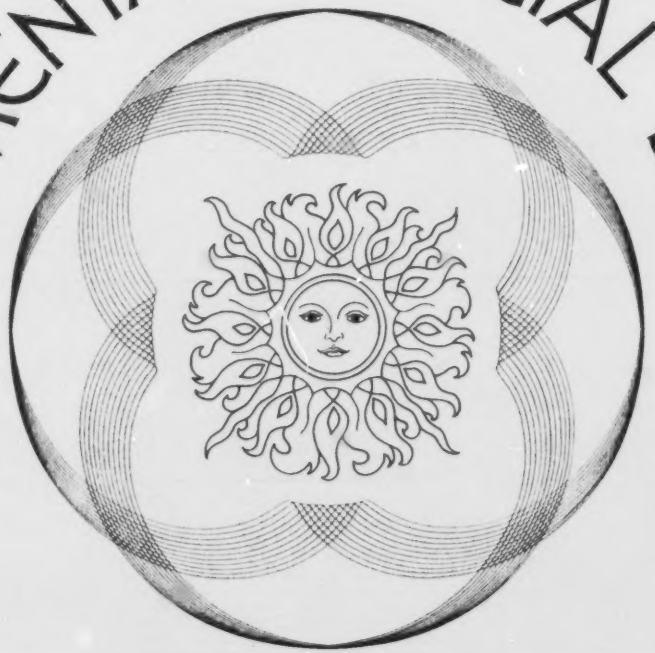
ENERGY EDUCATION IN ELEMENTARY SOCIAL STUDIES



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MINNESOTA ENERGY AGENCY
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Holt Databank System
- Holt, Rinehart & Winston, Publishers

GRADE LEVEL ANNOTATED INDEX OF LESSONS RELATED TO ENERGY EDUCATION WITHIN *HOLT DATABANK SYSTEM** Levels 1-6

*Holt Rinehart Winston 1976

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ENERGY EDUCATION IN ELEMENTARY SOCIAL STUDIES

Holt Databank System

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ENERGY EDUCATION AND SOCIAL STUDIES

Holt Databank System

FORMAT:

A team of elementary teachers of social studies indexed the *Holt Databank System* and the *Windows On Our World* program materials to an Outline of Energy Education Topics. This outline of concepts was developed by the Energy Task Force of the Minnesota Department of Education.

Nineteen supplementary activities were developed by the team, and are included after the annotated index.

ENERGY EDUCATION AND SOCIAL STUDIES

A Rationale

Energy Education becomes a more crucial component of the curriculum with each passing year. We recognize that today's social studies program must include a conscious and planned effort to make students more knowledgeable about energy; sources, uses, problems and possible solutions. It is important to do this without losing sight of the other equally crucial social needs of our society which ought to be reflected in our social studies - the positive and accepting view of self and others; the understanding and appreciation of diversity among people; the structure and function of the institutions in our culture and in other cultures; an introduction to the physical geography of the world; and an appreciation of the natural features, resources, and living things that comprise the world we live in.

This document, therefore, suggests that as we teach social studies and try to maintain a balanced approach to the many areas that beg to be emphasized, we can recognize the opportunities to develop and extend those ideas which are identified as energy education.

OUTLINE OF ENERGY EDUCATION TOPICS

(Used as the basis for the analysis of the Social Studies programs.)

I. BASIC ENERGY INFORMATION

- A. Definition - Properties
- B. Sources - Renewable and Non-renewable
- C. Forms: chemical, mechanical, radiant, nuclear, electrical
- D. Uses: Residential, commercial, industrial (agriculture, food processing, mining, manufacturing), transportation, utility generation
- E. Conversion Systems/Technologies
- F. Ways of conserving

II. SOCIETY's DEPENDENCE ON ENERGY

- A. Demands/needs related to resources (end-use) and life style
- B. Effects upon economy and economic system
- C. Effects on Political Relationships: local, national, international
- D. Values

III. POSSIBLE SOLUTIONS - PROBLEMS AND ADVANTAGES OF ENERGY ALTERNATIVES

- A. Alternative sources (types, uses, supply, time-lag) (values: cost, change in life style, trade-offs)
- B. Conservation (types, uses, supply, time-lag) (values: cost, change in life style, trade-offs)

IV. MINNESOTA'S ENERGY ISSUES

- A. Location, climate
- B. Sources available
- C. Problems with sources
- D. Ownership
- E. Control and effect of government policies and regulations
- F. Transportation
- G. Values

ENERGY CONCEPTS FOR ELEMENTARY EDUCATION*

Background Material for Teachers

DEFINITIONS

1. Energy is the capacity to do work or make something move. The "go" of things.

   A. Power is the rate that energy is produced or used.
   B. Efficiency is the amount of work done in proportion to the energy used.
   C. Work is done when an object is moved.
   D. Force is required to produce an acceleration in the motion of a body.

2. Energy is a resource.

3. Energy is the ability to cause change.

SOURCES: WHERE DOES ENERGY COME FROM?

1. Primary Sources

   Primary sources are sources naturally available on the earth.

   A. Renewable sources are recurring or continuous.

      1. The sun is the main source of energy.
      2. Other renewable sources of energy are: geothermal, wind, hydro, tidal and organic material.

         Although they are available, the following sources are little used and need further development:

         a. Wind power
         b. Solar power

* From Energy Task Force, Minnesota Department of Education

c. Tides
d. Geothermal
e. Organic wastes
f. Peat (through some processes of recovery)

B. Non-renewable sources are sources that take a great deal of time and cannot be replenished in human time spans.

1. Some non-renewable sources are fossil fuels: coal, oil, natural gas, and peat.

a. Currently most of our usable energy comes from fossil fuels.
b. Fossil fuels are non-renewable resources in limited supply.
c. No one knows exactly how much fossil fuel remains. Estimates depend on finding out where they are available, how easy it would be to recover them, and the cost of this recovery.
d. Some fossil fuels are in difficult places for recovery (e.g., oil, shale, tar sands, liquid natural gas and liquid petroleum gas.)

2. Another non-renewable source is uranium used in nuclear fission reactors.

2. Secondary Sources

Secondary sources of energy are products of human technology.

A. Electricity is a secondary source of energy. Primary sources of energy are used to make it.
B. Some other secondary sources of energy are: solid wastes, fuel cells and the conversion of chemical energy.

3. Differences among energy sources:

A. Some work only under certain conditions or are practical only under certain conditions.
B. Some work only in certain places.
C. Some take much time to form.
D. Some are slower and less efficient.
E. Some take less time to convert.
F. Some need technology to be converted to usable forms.

STATES

The basic states of energy are energy at rest and energy at work.

1. Kinetic energy is energy at work; the product of force and movement. (Examples: machines at work, persons at work, burning fuels.)

2. Stored or potential energy is energy at rest which can be made active. (Examples: nuclear energy, fossil fuels, a boulder on top of a hill, a battery, or water behind a dam.)

STORAGE

1. Potential energy is stored energy.

   A. Fossil fuels are stored chemical energy and are made active by combustion.
   B. Nuclear energy is stored energy in the atom.

2. Solar, tidal and geothermal energy are sources of energy flows; ways must be found to store them.

FORM: HOW CAN ENERGY BE SEEN AND FELT?

1. Energy can take many forms.

   A. Energy can be detected in the following forms: heat, light, motion.
   B. Energy can take the following forms: thermal, radiant, chemical, mechanical, sound and nuclear.

2. Energy can be measured (e.g., temperature measurement, measuring the change of position, reading meters such as gas meters, ohm meters and volt meters).

ENERGY CONVERSION: WHERE DOES ENERGY GO?

**1. Energy can be converted from one form to another.

2. Once energy is used, it cannot be used again in that form. (Note: This is a beginning level for the understanding that energy is neither created nor destroyed.)

3. In changing energy from one form to another, some energy is lost.

4. As energy is used, it produces by-products (such as heat) which may be recycled or which may be unavailable for us.

ENERGY TRANSFER

Energy is transferred by convection, radiation and conduction.

TRANSPORTATION OF ENERGY

Energy sources are transported by pipe or pipeline, radiation, ship or barge, wire or line, truck and train.

HOW IS ENERGY USED?

BASIC USES

1. Energy is needed to do work and to live.
2. Nothing acts, nothing moves without energy.
3. Energy drives the muscles of human beings.
4. Machines use energy to make things.
   A. Some machines are more efficient than others.
5. Machines use energy to change energy from one form to another (e.g., chemical to mechanical)
6. Machines use energy to change potential energy to kinetic energy.
7. Energy must be spent to get energy we can use.
8. Energy is used in our daily living to make our clothes, food, paper, and to move us from place to place in cars and busses.

PERSONAL/SOCIAL USES

1. As individuals we are personally dependent upon energy.

2. Individuals and groups have responsibility for energy conservation and use.

3. Energy can be conserved by developing energy saving habits.

4. Societal actions and values extend to exhaust available supplies of energy.

   A. Past and present use of energy resources precipitated and accelerated the energy problem.
   B. In order to impact on the energy problem, old habits must be changed.

5. Population changes directly influence energy use, availability and supply.

NATIONAL USES

1. Industry

   Industry uses much of our country's energy.

   A. About 40 percent of all energy is used by industry.
   B. Industry uses energy for heating, electricity, running machinery, electrolytic processes, processing raw materials, and maintaining a plant or office.
   C. The following industries are high users of energy: food processing, oil pumping and refining, steel and aluminum manufacturing, paper manufacturing, glass/clay/stone products, and chemical industries.

2. Transportation

   Energy is used for transportation.

   A. Transportation requires 25 percent of our country's energy.
   B. Automobiles account for more than half of the energy used for transportation.
   C. Trucks, airplanes and trains also use energy.

3. Residential

   Homes use energy for heating, cooling, lighting and appliance use.

   A. Twenty percent of the country's energy is used for residences.
   B. Homes use the highest amounts of energy for heating, water heating, refrigeration and cooking.

4. Commercial

   Energy is used for commercial places such as offices, businesses, hotels, schools, hospitals and restaurants.

MINNESOTA USE

Minnesota's use of energy is different from the national picture.

1. Minnesota has limited non-renewable energy sources.
2. Minnesota depends upon energy sources from outside the state.
3. Minnesota has special problems of transmission and transportation of energy resources.
4. Minnesota has a long heating season requiring greater residential use of energy.

CONSERVATION

1. Consumption of fossil fuels has been increasing faster than the rise in population during the past 30 years. The demand will increase.
2. We must conserve the non-renewable fuels that are left.
3. Major energy users must become big energy savers.
4. Energy conservation buys time to develop new alternative sources.
5. Some ways that major energy savings can be practiced are: Industry - building design and industrial operating changes, recycling and increased energy transmission efficiency; Transportation - mass transit and use of smaller automobiles; Residential - use of more efficient appliances, recycling and improved home insulation.
6. People must identify, examine, and clarify their own values and behave in a way that is consistent with those values.

WHAT ARE THE CONSEQUENCES OF ENERGY USE?

TRADE OFFS

1. Economic, ecological, aesthetic, political and social trade-offs are involved when decisions are made regarding the use of energy resources.

2. Energy-environment decisions require making value judgments of the trade-offs involved. A decision involves the acceptance of the possible disadvantages of the choice along with the advantages.

3. As we use up our non-renewable resources and have a hard time paying for foreign fuels, there will be more governmental action, voluntary conservation, market place restructuring or a combination of these.

ECONOMIC CONSEQUENCES

1. Supply

   A. We are consuming our energy sources faster than we are able to bring alternatives into practicality.
   B. New sources of energy must be identified and developed.
   C. U.S. oil and natural gas supplies will be depleted in about 100 years even if there is not an increase in our present rates of consumption.
   D. U.S. oil and gas production does not meet our nation's needs. Oil imports are increasing each year.
   E. Historically, there has been from three to five decades between the first speculation into new sources of energy and their commercial feasibility.

2. Cost

   A. As energy is used or conserved, there is a direct impact on economic systems.
   B. Future energy systems will demand extensive capital.
   C. High costs of new energy sources limit their use.

3. Cost/supply Interaction

   A. Shortage of a material such as oil occurs when, at a given price, the demand exceeds the supply.

B. Energy scarcity requires that growing economics make a vastly larger capital investment and/or reduce their energy demands.

ENVIRONMENTAL CONSEQUENCES

1. As energy is used or conserved, there is direct impact on our environment.

2. Energy production affects our surroundings.

3. Sources of energy that we use differ in their environmental effects.

4. A concern for the environmental consequences of energy use may require additional energy and also may demand additional money.

LIFE STYLE CONSEQUENCES

1. The relationship between energy sources, consumption and life styles must be examined.

   A. Energy use has an impact on family economics.
   B. Energy conservation has an impact on family life style.

2. Changes of energy use result in the creation of some jobs and the loss of others.

3. New or modified perceptions of living and working styles will be needed to deal with the energy problem.

POLITICAL CONSEQUENCES

1. The necessity to import oil influences U.S./foreign policies.

2. Environmental and economic effects of energy development and use affect relationships between people in regions of this country and the world.

3. If the energy problems reach a crisis stage, there will be more governmental action in the distribution and consumption of energy resources.

4. Our present energy practices will affect alternatives of societies in the future.

SOCIAL STUDIES INDEX OF ENERGY TOPICS

Compilation in *Holt* and *Windows*

	LEVEL 1		LEVEL 2		LEVEL 3		LEVEL 4		LEVEL 5		LEVEL 6	
	H*	W*	H	W	H	W	H	W	H	W	H	W
I. Basic Energy Information												
A. Definition - Properties	X	X				X		X			X	X
B. Sources - Renewable and Non-renewable	X		X		X			X		X		X
C. Forms: Chemical, mechanical, radiant, etc.	X							X				
D. Uses: Residential, commercial, industrial (agriculture, food processing, mining, manufacturing), transportation, utility generation	X		X		X	X		X		X	X	X
E. Conversion technology	X		X					X		X		X
F. Ways of conserving			X					X		X	X	X
II. Society's Dependence on Energy												
A. Demands/needs related to resources (end-use) and life style	X	X	X	X	X	X	X	X	X	X	X	X
B. Effects upon Economy and Economic system	X		X		X		X	X	X	X	X	X
C. Effects on Political Relationships: local, national, international		X				X	X	X	X	X	X	X
D. Values	X	X	X	X	X	X	X	X		X	X	X
III. Possible Solutions - Problems and Advantages of Energy Alternatives												
A. Alternative Sources	X	X					X	X				
B. Conservation	X		X	X				X				X
IV. Minnesota's Energy Issues												
A. Location, Climate								X				
B. Sources Available												
C. Problems with Sources												
D. Ownership												
E. Control and effect of government policies and regulations												
F. Transportation												
G. Values												

*W = *Windows On Our World*
*H = *Holt Databank*

OVERVIEW OF ENERGY EDUCATION CONTENT WITHIN THE *HOLT DATABANK SYSTEM**

Levels 1-6

	Level 1	Level 2	Level 3	Level 4	Level 5	Level 6
ENERGY TOPICS						
I. Basic Energy Information						
A. Definition - Properties	1, p. 15					3, pp. 60-61
B. Sources - Renewable and non-renewable	1, p. 15 2, p. 47 2, p. 68 5, p. 169 Related Act. p. 184	3, p. 107 4, p. 134	6, p. 185			
C. Forms: chemical, mechanical, nuclear, radiant, etc.						
D. Uses: Residential, commercial, industrial (agriculture, food processing, mining, manufacturing), transportation, utility generation	1, p. 15 2, p. 47 2, p. 55 3, p. 110 3, pp. 108-111 4, p. 140	5, p. 162	6, p. 178 6, p. 182 7, p. 211			3, pp. 60-63
E. Conversion technology	1, p. 15 2, p. 47	4, p. 134				
F. Ways of conserving		4, pp. 142-143				3, pp. 60-61
II. Society's Dependence on Energy						
A. Demands/needs related to resources (end-use) and life style	2, p. 47 2, pp. 52-53 3, p. 99 4, p. 141	3, p. 89 3, p. 99 3, p. 100 4, p. 135 4, p. 148	2, pp. 38-41 2, p. 43 5, pp. 160-170 6, p. 181 6, p. 183 6, p. 203	5, pp. 196-197 8, pp. 284-287	1, pp. 6-7 2, pp. 53-54 9, pp. 238-239	3, pp. 62-63 3, pp. 68-69 3, p. 79 3, p. 90 5, pp. 149-152 9, p. 246 10, pp. 270-271
B. Effects upon economy and economic system	2, p. 55 4, p. 130	3, p. 107 5, p. 166	6, p. 183	5, pp. 198-199 8, pp. 284-289	9, pp. 238-239	3, pp. 62-63 3, p. 79 5, pp. 149-152 9, p. 246 10, pp. 270-271
C. Effects on political relationships: local, national, and international				5, pp. 200-201	9, p. 240	3, pp. 70-72 3, p. 79 9, p. 246 10, pp. 280-281

* Holt Rinehart Winston, 1976

KEY: pp = pages in Teacher's Guide
Arabic Numerals = Units

	Level 1	Level 2	Level 3	Level 4	Level 5	Level 6
II. Society's Dependence on Energy (continued)						
D. Values	3, p. 107 4, p. 132 5, p. 174	3, p. 122 5, p. 162	3, pp. 111-113 4, p. 129 6, p. 182 7, p. 212 7, pp. 234-238	5, pp. 196-197 5, pp. 198-199 5, pp. 200-201		3, pp. 62-63 3, pp. 70-72 9, p. 246 10, pp. 280-281
III. Possible Solutions - Problems and Advantages of Energy Alternatives						
A. Alternative sources: types, uses, supply, time-lag/ values: cost, change in life style, trade-offs	4, p. 144			5, pp. 196-197 5, pp. 198-199 5, pp. 200-201 5, pp. 196-201		
B. Conservation: types, uses, supply, time-lag/ values: cost, change in life style, trade-offs	4, p. 148	4, p. 135 4, pp. 136-137				
IV. Minnesota's Energy Issues						
A. Location, climate						
B. Sources available						
C. Problems with sources						
D. Ownership						
E. Control and effect of government policies and regulations						
F. Transportation						
G. Values						

KEY: pp = pages in Teacher's Guide
Arabic Numerals = Units

HOLT DATABANK SYSTEM - ANNOTATED INDEX

Level 1

People

TOPIC	UNIT	LESSON	pp.TG*	ANNOTATIONS
I. Basic Energy Information				
A. Definition - Properties	1	7	15	Opportunity for definition.
B. Sources - Renewable and non-renewable	1	7	15	Fire, coal, electricity.
	2	2	47	Fire as a source of early heat and light.
	2	5	68	Opportunity to discuss coal as a source of energy.
	5	2	169	Find natural sources of energy found in Alaska, Hawaii and Texas.
		(RA)#5*	184	Where oil may come from.
D. Uses: residential, commercial, industrial (agriculture, food processing, mining, manufacturing), transportation, utility generation	1	7	15	Oven, stove.
	2	2	47	
	2	8	55	Home appliances and how they have changed over time.
	3	9	110	Food processing
	3	8&9	108-111	Agriculture
	4	3	140	Compare energy uses of Norway vs. other countries.

*Pages in Teacher's Guide
*Number of related activity included

TOPIC	UNIT	LESSON	pp. TG*	ANNOTATIONS
I. Basic Energy Information (cont.)				
E. Conversion technology	1	7	15	Fire gives heat.
	2	2	47	
II. Society's Dependence on Energy				
A. Demands/needs related to resources (end-use) and life style	2	2	47	Fire used to cook food and keep animals away.
	2	5&6 1	52-53	How change occured over time in methods of heating, etc.
	3	2	99	Opportunity to discuss forms or needs for heating in winter.
	4	4	141	How has energy changed people's life styles over the years?
B. Effects upon economy and economic system	2	8	55	How time changed needs for different forms of energy.
	4	8	130	How has energy allowed logging to change?
D. Values	3	7	107	Discuss energy as it relates to farm machinery and farming techniques in the U.S. and abroad. How has increased energy use affected our environment? How does the need for energy change our jobs, lives, etc?

TOPIC	UNIT	LESSON	pp. TG*	ANNOTATIONS
III. <u>Possible Solutions - Problems and Advantages of Energy Alternatives</u>				
A. Alternative sources (types, uses, supply, time-lag) (values: cost, change in life style, trade-offs)	4	6	144	Energy problems, like environmental problems, can have solutions.
B. Conservation (types, uses, supply, time-lag) (values: cost, change in life style, trade-offs)	4	9	148	How much energy will we have in the future? How might it change our lives and work?

HOLT DATABANK SYSTEM - ANNOTATED INDEX

Level 2

Communities

TOPIC	UNIT	LESSON	pp.TG*	ANNOTATIONS
I. Basic Energy Information				
B. Sources - Renewable and non-renewable	3	16	107	One way oil is brought to people.
	4	9	134	How can fire be a source of energy?
D. Uses: residential, commercial, industrial (agriculture, food processing, mining, manufacturing), transportation, utility generation	5	7	162	How has energy use changed over the years?
E. Conversion technology	4	9	134	How can fire be used as energy?
F. Ways of conserving	4	15&16	142-143	Discuss that there is a problem with a shortage of energy sources. How can we in our factories and our lives use machine powered tools and yet be energy efficient? Example: (1) Use renewable resources as the source of energy. (2) Use things over again in another form - recycle.
II. Society's Dependence on Energy				
A. Demands/needs related to resources (end-use) and life style	3	5	89	Discuss people's needs for energy. Both city and country needs.

16 *Pages in Teacher's Guide

TOPIC	UNIT	LESSON	pp. TG*	ANNOTATIONS
II. Society's Dependence on Energy (Continued)	3	11	99	What are the energy needs in the desert?
	3	12	100	(Filmstrip) In the production flow - what are people's needs related to the production of cars?
	4	10	135	Opportunity to discuss efficiency of tools related to efficiency of energy.
	4	20	148	How will tools of the future use energy efficiently?
B. Effects upon economy and economic system	3	16	107	One way people use oil as producers and consumers.
	5	9	166	How have the changes in cars affected energy?
D. Values	3	1v	122	Opportunity to discuss solving energy problems.
	5	7	162	Discuss the energy trade-offs we make for tools changing over time. Example: wood stove to electric oven, car travel to planes.
III. Possible Solutions - Problems and Advantages of Energy Alternatives				
B. Conservation (types, uses, supply, time-lag)	4	10	135	If we make tools and energy consumption more efficient, what are the trade-offs?

TOPIC	UNIT	LESSON	pp. TG*	ANNOTATIONS
III. Possible Solutions (continued)				
(values: cost, change in life style, trade-offs)	4	11&12	136-137	What are the trade-offs of using physical energy vs. machine powered energy?

HOLT DATABANK SYSTEM - ANNOTATED INDEX

Level 3

Cities

TOPIC	UNIT	LESSON	pp.TG*	ANNOTATIONS
I. Basic Energy Information				
B. Sources - Renewable and non-renewable	6	6	185	See Enriching the Lesson.
D. Uses: residential, commercial, industrial (agriculture, food processing, mining, manufacturing), transportation, utility generation	6	1	178	How would lives be different without cars? What would be the effect on energy?
	6	4	182	What energy sources are used in automobiles?
	7	1	211	Look at energy consumption in the home as well as water consumption.
II. Society's Dependence on Energy				
A. Demands/needs related to resources (end-use) and life style	2	4&5	38-41	Opportunity to hypothesize what kind of energy might have been used by the (1) mound dwellers (2) people of Tikal.
	2	16	43	What were the possible uses of energy in Zimbabwe?
	5	7-13	160-170	Discuss how energy needs are different/similar between cities and hinterlands.
	6	3	181	Discuss how uses of energy have changed since 1897.

*Pages in Teacher's Guide

TOPIC	UNIT	LESSON	pp. TG*	ANNOTATIONS
II. Society's Dependence on Energy (Continued)				Discuss the trade-offs that the automobile has given us. (Example: ease of travel--waste of energy; more cars--less oil.)
	6	5	183	Add question 8 in Getting Started, "How Has Energy Use Changed?"
	6	16	203	Add the topic of energy to the goals of the lesson.
B. Effects upon economy and economic system.	6	5	183	How did energy need affect the economy in 1897?
D. Values	3	13-16	111-113	Opportunity to discuss the role of energy in the formation of cities in the U.S.
	4	6	129	If the electric elevator and automobile started to change cities, how did that affect energy use?
	6	4	182	Opportunity to discuss the value of modern transportation in relation to the energy consumed. How can you make wise choices in this regard?
	7	2	212	Opportunity to relate the idea that choices must be made about water as well as energy.
	7	16&19	234-238	What decisions need to be made about energy use in relation to pollution?

HOLT DATABANK SYSTEM - ANNOTATED INDEX

Level 4

Cultures

TOPIC	UNIT	LESSON	pp.TG*	ANNOTATIONS
II. Society's Dependence on Energy				
A. Demands/needs related to resources (end-use) and life style	5	6	196-197	Factories needed coal; mining jobs changed life style in Appalachia.
	8	1	284-287	Water power, steam and electricity used to run machines; production of goods increased; factories used unskilled labor.
B. Effects upon economy and economic system	5	7	198-199	Jobs became scarce with use of new machines and oil or gas instead of coal.
	8	1	284-287	Goods produced faster, cheaper; fewer jobs; move from rural to urban environment.
C. Effects upon political relationships: local, national, international	5	8	200-201	Mine closings resulted in people looking to government for money, food, clothing.
D. Values	5	6 7 8	196-197 198-199 200-201	People question decision of job choice, loss of freedom due to changes in economy and alternate sources of energy
III. Possible Solutions - Problems and Advantages of Energy Alternatives				
A. Alternative sources	5	6 7	196-197 198-199	Factories' use of oil and gas instead of coal; WW II increased

*Pages in Teacher's Guide

TOPIC	UNIT	LESSON	pp. TG*	ANNOTATIONS
II. <u>Possible Solutions - Problems and Advantages of Energy Alternatives</u> (types, uses, supply, time-lag) (values: cost, change in life style, trade-offs)		8	200-201	need for coal; strip mines opened; movement to cities.

HOLT DATABANK SYSTEM - ANNOTATED INDEX

Level 5

American History

TOPIC	UNIT	LESSON	pp.TG*	ANNOTATIONS
II. Society's Dependence on Energy				
A. Demands/needs related to resources (end-use) and life style	1	2/3	6-7	Focus on wind power for boats.
	2	12	53-54	Use of muscle energy for mound building.
	9	1	238-239	Industrial revolution resulted in increased use of energy sources; change in life styles.
B. Effect upon economy and economic system	9	1	238-239	Increase in factories used more energy resources and increased production.
C. Effects on political relationships: local, national, international	9	2	240	Owners vs. workers; government interference with industry.

*Pages in Teacher's Guide

HOLT DATABANK SYSTEM - ANNOTATED INDEX

Level 6

Technology

TOPIC	UNIT	LESSON	pp.TG*	ANNOTATIONS
I. Basic Energy Information				
A. Definition - Properties	3	3	60-61	Opportunity to define as steam used to run engine, pushing pistons up and down.
D. Uses: residential, commercial, industrial (agriculture, food processing, mining, manufacturing), transportation, utility generation	3	3,4	60-63	Steam engines could power a pump, drive machinery of spinning jennies; used in coal mining and transportation.
F. Ways of Conserving	3	3	60-61	Watt's steam engine used less fuel than Newcomen's.
II. Society's Dependence on Energy				
A. Demands/needs related to resources (end-use) and life style	3	4	62-63	Steam engine changed textile industry; created jobs and demand for yarn and cloth.
	3	7,8	68-69	Factory workers had crowded living conditions.
	3	16	79	New machinery allowed Japan to excel in production of iron, steel, chemicals, plastics.
	3	21	90	Worksaving machines are enjoyed by modern, middle-class Japanese.

*Pages in Teacher's Guide

TOPIC	UNIT	LESSON	pp. TG*	ANNOTATIONS
II. Society's Dependence on Energy (continued)				
	5	8-11	149-152	Use of machines helped Mexico to modernize.
	9	11	246	Steel industry used large supply of coal.
	10	9	270-271	Computer powered by electricity does the work of many.
B. Effects on economy and economic system	3	4	62-63	Use of steam engine changed production of textiles from cottage to factory; more and cheaper cloth could be made.
	3	16	79	New machinery allowed Japan to excel in production of iron, steel, chemicals, plastics.
				Overproduction in Japan's factories resulted in building ships, trains, trucks; new products were made.
	5	8-11	149-152	Use of machines helped Mexico to modernize.
	5	8-11	149-152	Corn mills and sewing machines saved time, allowing people of Tepoztlan to grow fruit and raise animals to sell.
	9	11	246	Coal was cheap, available, created jobs, heated homes.
	10	9	270-271	Computer used to predict weather, control flow of electricity, can do

TOPIC	UNIT	LESSON	pp. TG*	ANNOTATIONS
II Society's Dependence on Energy (continued)				many kinds of jobs over and over; this invention created new jobs.
F. Effects on political relationships: local, national, international	3	9, 10	70-72	Steam-powered machines destroyed by workers fighting factory system; strikes a form of protest; unions were formed; new laws passed.
	3	16	79	Steam engine and other industrial machines were encouraged by government; students sent abroad to learn new business methods.
	9	11	246	Demand for steel during WW II.
	10	14	280-281	Social conditions could be measured by government agencies.
D. Values	3	4	62-63	Working conditions changed by use of steam engine.
	3	9, 10	70-72	New machines create new responsibilities for factory owners.
	9	11	246	Air pollution problems.
	10	14	280-281	Technology has created problems.

RELATED ACTIVITIES: IDEAS FOR ADDITIONAL TEACHING AND LEARNING ACTIVITIES

1. **DEFINITIONS**

Have students find the word "energy" in glossary of text, then create a symbol or picture for the definition. Display their work.

Grade 4 glossary entry: the strength or power to move, to grow, to change things, or to do work.

Grade 5 glossary entry: the power to move or change things; for example, to give off heat or to operate machinery.

Grade 6 glossary entry: the ability to do work.

2. **LEISURE TIME**

Ask students to list leisure time activities that their own family enjoys. Have students code those that depend on the use of electricity or gasoline. Discuss.

3. **ENERGY BINGO**

Ask class what comes to mind when they hear word "energy". List at least twenty words on chalkboard. (This will give you an idea of class's energy vocabulary and concepts. Have each student fold paper into 16 squares; tell them to fill one square with word "sun"; this will be "free" square. Have students fill in other squares as they wish with words from the chalkboard. You mix up and call out words; as they find one on their paper that matches, they X it out. When they complete a row (across, down, diagonally), they call "Bingo." (This works best after terms have been introduced. Add another dimension by having the first winner guess who will be the second winner, etc.)

4. **TV COMMERCIAL**

Have small groups plan and present a TV commercial that might convince people to cut down on use of energy. Each group could concentrate on electricity or gasoline or natural gas.

5.	ENERGY COLLAGE	Have groups use magazine pictures to show relationships between primary energy sources, both renewable and non-renewable and uses. For example: sun-plants-food; oil well--gas pump--car.
6.	BIRTHDAY CANDLE POWER	Use unlit birthday candle to discuss concept of energy at rest (potential or stored energy). Light it to discuss concept of observing energy at work (kinetic or active energy). What energy is detected (heat, light) as candle burns? Use two pictures (Fideler, Silver Burdett, WOW activity cards, others) that show mainly potential energy and kinetic energy. Have small groups find and categorize other pictures, then choose the one they feel represents the best example of each and show choices to the class.
7.	ANIMAL CRACKERS	Give each student an animal cookie. Have student tell were it belongs on the food pyramid. Use with Level 4 WOW, Unit 7, Lesson 2.
8.	SCHOOL ENERGY SURVEY	Have small groups prepare interview questions and survey school for ways energy is used other than for heating and lighting. (Questions for engineer or custodian can relate to floor machines, grass cutting, snow removal. Questions for office staff can relate to typewriters, duplicating and Xerox machines. Questions for AV person can relate to a variety of equipment. Questions for lunchroom staff can relate to transportation and preparation of food. Questions about parking lot and playground can relate to lights at night, trash disposal trucks, buses transporting students, private cars.) Chart the information and discuss. Results may be shared, for groups may suggest ideas that are practical ways to save energy at school, other than turning off lights and turning down thermostats. Post the ideas in strategic places.
9.	HOME ENERGY SURVEY	Have students list every appliance the family uses besides those used to heat and light the home. Check kitchen: stove, electric can opener, electric knife, refrigerator, iron, electric fry pan, corn popper, electric roaster, microwave oven, toaster, mixer, radio, TV. Check bathrooms and bedrooms: hair dryer, electric blankets, curling iron, electric tooth brushes, fans, sun lamps. Check laundry and utility closet: washer, dryer, hotwater heater, vacuum, hand-vacuum. Check other rooms: stereos, TV's and radios, fans, or air-conditioning. Discuss the idea that all new appliances must have an EER (energy-efficiency rating). Have each student

		check the five appliances that are most important to her/him. Ask students to think about what they have learned about themselves.
10.	ADVANTAGES-DISADVANTAGES	An extension to #9. above is to have students list advantages and disadvantages related to an appliance they use often, such as time saved, work made easier, steps saved, etc.
11.	COOPERATION-COMPETITION GAME	Prepare four index cards by drawing 12 lines across each, like 12 rungs on a ladder. Divide class into four color teams. Give each team one index card and a different color marker (may be a crayon). Explain rules: each team is to try to get rungs of the ladder colored; no adjoining rungs may have the same color; a team may not use its own color; each team must offer to color a rung in exchange for another team coloring their rung. When ladders are all colored, explore: why did we act as we did; how did one person's actions make someone else act; what feelings did we have; when is cooperation better than competition. Relate to energy shortage.
12.	INTERVIEW	Have students interview grandparents or someone who lived in the 20's and 30's to find out: how their home was heated and cooled; how food was prepared and kept cool; how they went to school; how they shopped for food and other needs; how and where their families went for leisure-time activities; how clothes were washed and dried, etc.
13.	REDDY KILOWATT	Tell students that an advertising slogan NSP used several years ago was "Electricity is penny cheap-from NSP." Have them make up slogans that NSP could use today.
14.	MURAL	Using Holt as a reference, make an energy use study by making a mural of the ways the various countries consume energy. (U.S.A., Japan, Kenya, Borneo, Germany, etc.) This could be based on actual facts that have been researched by the children or could come from their good deductions after seeing pictures in their books.
15.	FIELD TRIP	Visit a place where energy is converted or used in large amounts. Have the children prepare a set of questions they want answered about energy.

16. **GROUP & LABEL**

Collect Sunday newspaper advertising inserts and catalogs advertising home appliances and tools for home use. Cut apart to separate each item. Have pupils group the items in as many ways as they can and label the groups. The groups that are formed will probably relate to the use, the power used, or the value (most important to least important need) of the tools. Discussion following this activity should make the class aware of the many ways we depend on energy and sensitive to the differing priorities people may have for the importance of specific tools.

17. **PRODUCERS CAN HELP, TOO**

Save the enclosures from NSP, Minnegasco, etc. monthly bills. Clip ads that stress gasoline-efficient engines in cars, energy-efficient refrigerators, etc. Have class discuss ways that business firms do and can help us save energy.

18. **NOW & THEN**

Compare the items in Sears catalog of 1906, 1928 and the 1970's. (See Learning Materials List for ordering these catalogs.) What are some statements that can be made about the changes in products during those years and the use of energy required. How have these changes affected our life style?

19. **MEETING NEEDS-USING ENERGY**

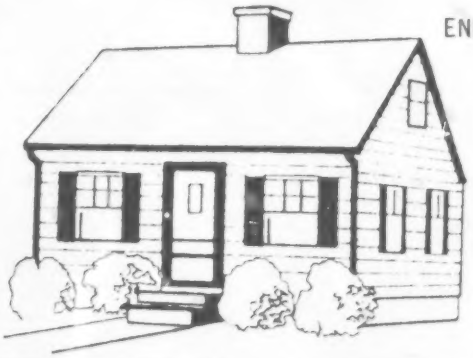
List the basic needs people have for physical survival - food, shelter, and clothing. Divide the class into six groups - two groups for each of the categories, food, shelter, clothing. Assign one basic need to each group and ask the group to indicate the kind of energy used to meet that basic need. (See suggested worksheet form.)

If filmstrips and study prints are available as resources, some groups might be asked to indicate how these basic needs were met in pre-industrial times or in other cultures, e.g., caves, log houses, tepees, huts, home-grown food, spinning wheel, etc. Compare the energy used from one time or place to another.

Some classes might want to look at ways these basic needs might be met in the future with the emphasis on different energy sources and/or less energy use, e.g., solar heat, underground homes, different transportation systems, synthetic food, etc.

Worksheet for Activity #19

GROUP _____



ENERGY NEEDED - to build the shelter

- to live in the shelter

GROUP _____

ENERGY NEEDED - to produce the food

- to prepare and serve the food

GROUP _____

ENERGY NEEDED - to manufacture clothing

- to maintain clothing

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